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Patient and Healthcare System Delays in Tuberculosis Diagnosis and Tuberculosis Treatment

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ABSTRACT

Background: Long diagnosis delay contributes significantly to the failure to eradicate tuberculosis. The objective of this study was to evaluate the total, patient and system delays in diagnosis of pulmonary bacilliferous in the six tuberculosis Diagnostic and Treatment Centers at Kenyatta National Hospital-Nairobi County.

Methods: A descriptive cross-sectional study was conducted among 384 microscopy-positive pulmonary tuberculosis patients in 2022 to address this objective. It concerned the socio-demographic, clinical, microbiological characteristics, and referral location/pathway characteristics of the patients. We then calculated the different delays. The "patient" (time from first symptoms to first consultation), "system" (time from first consultation to first diagnosis) and total (time from first symptoms to diagnosis) median diagnostic delay were estimated.

Results: The response rate for quantitative data was 99.2% (n =127) from a sample size of 128 of the TB patients that presented to the hospital for diagnosis and treatment. For the focus group discussion, the investigator interviewed two (2) groups of seven (14) for both patients and health care workers at the TB clinic at KNH. Bivariate analyses showed significant associations on gender of the respondents that indicated that majority of the respondents were females 51.2% (n= 65) compared to the male counterpart with 48.8% (n = 62). This shows that women are more sensitive to their health issues compared with the male counterparts. This indicate that those with age (40 to 49) were majority 32.3% (n = 41) followed closely by age (30 to 39) 21.3% (n = 27). This is a middle age group thus indicating that they are high-risk group. If intervention is done, then they should be t2argeted to benefit.

Conclusion: Well laid out TB management (diagnosis and treatment) at Kenyatta National Hospital is a leeway to efficient healthcare services delivery to the people. Kenyatta National hospital has various departments dealing with various ailments and complications. An effective TB diagnosis and treatment team is crucial in preparing for TB management at the facility. Due to the nature of the illness, TB patients and their households can face severe direct and indirect financial and economic costs. These pose barriers that can greatly affect their ability to access diagnosis and treatment, and to complete treatment successfully. Costs included in the TB-specific indicator include not only direct medical payments for diagnosis and treatment, but also direct nonmedical payments (e.g., transportation and lodging) and indirect costs (e.g., lost income). In contrast to SDG Indicator 3.8.2, the TB-specific indicator is restricted to a particular population: people diagnosed with TB who are users of health services that are part of NTP networks (Denholm JT .2021 et al.).

1. Introduction

Tuberculosis continues to be a significant global public health issue. In 2018, there were 7.0 million new cases of TB reported, which is an increase from the 6.4 million cases reported in 2017. This rise in tuberculosis cases from 2009 to 2012 is concerning. Despite advancements in disease prevention, management, and healthcare services, approximately 10 million people still become ill with TB each year (Gupta RK, 2015, et al). The global reporting of new TB cases in 2017 was substantial, highlighting the ongoing public health concern and the resulting morbidity and mortality associated with tuberculosis. The disease can be transmitted through the air or by personal contact with infected individuals. The manifestations of TB can vary among the population, with some patients experiencing symptoms shortly after infection, while others may fall ill years later due to a weakened immune system (Hershkovitz I, 2015, et al).

Population groups with the highest risk of contracting TB are children under the age of five, individuals over the age of 50, and those who have weakened immune systems. According to Negin et al. (2015), the World Health Organization (WHO) estimates that 2 billion people, which is equivalent to one-third of the global population, are infected with the TB-causing bacillus. In 2016, 1.7 million people worldwide lost their lives to TB, with 95% of these deaths occurring in low-resource countries, solidifying TB as the primary infectious cause of death on a global scale.

The global success rate for individuals treated for TB in 2020 remained at 86%, consistent with the previous year, indicating that the standard of care was upheld during the initial phase of the COVID-19 pandemic. The implementation of restrictions, such as lockdowns, and changes in behaviour, like increased mask usage, may have also contributed to the decrease in TB transmission in 2020 and 2021. The adverse effects of the pandemic on various TB determinants, such as malnutrition, poverty, and income levels, likely influenced both the incidence and mortality rates of TB (WHO, 2022). The decline in TB case notifications during this period resulted in a decrease in case detection, leading to a rise in the number of individuals with undiagnosed and untreated TB within communities. Strict lockdown measures were associated with a 50% reduction in transmission (UI: 25–75%). While reductions in transmission outside of lockdown periods were not assumed, interventions like mask-wearing may have continued to have a positive impact in certain countries.

The consequences of delaying the diagnosis and treatment of tuberculosis (TB) are significant for both disease control at the individual and community levels. On an individual level, a patient who experiences a delayed diagnosis of TB is at risk of developing advanced stages of the disease and experiencing poorer treatment outcomes. At the community level, a patient with a delayed diagnosis can transmit the infection to close contacts, with an untreated smear-positive TB case infecting approximately 15 people each year. Consequently, the delay in seeking care perpetuates the transmission of TB. The journey to receiving care, starting from the onset of symptoms to diagnosis and treatment, can be complex and may lead to further delays in seeking care, ultimately contributing to patient morbidity and mortality (Gupta RK, 2015 et al.).

In Kenya, tuberculosis stands as the prevailing infectious ailment. A survey conducted during 2015-2016 revealed a burden of 426 tuberculosis cases per 100,000 individuals, surpassing the previous estimations by more than twofold. Throughout 2019, approximately 140,000 individuals were believed to have contracted tuberculosis, yet only 84,345 cases were diagnosed and officially reported to the National Tuberculosis authorities.

The National Tuberculosis Program (NTP) reveals that more than 60% of estimated tuberculosis cases go undiagnosed or unreported. The majority of diagnosed and reported TB cases are male, with 10% falling under the age of 15. In 2019, Kenya had an estimated 2,200 cases of drug-resistant tuberculosis (DR-TB), but only 508 cases were detected and reported to the NTP. Tuberculosis incidences in Kenya decreased by 10.4% in 2019, with 72,943 cases reported in 2020, marking a 15.7% decrease from the previous year. The country is expected to have over 140,000 tuberculosis infections by 2020, with 48% of new cases being identified. Nairobi (13%), Meru (5%), Kiambu (5%), Mombasa (4%), and Nakuru (4%) counties reported the highest number of tuberculosis cases, while Lamu (0.4%), Tana River (0.5%), and Elgeyo Marakwet (0.6%) counties reported the least. The county profiles section of this report provides a detailed analysis of the performance of each of the 47 counties across various indicators.

2. Methods and material

2.1. Study area, design and period

Nairobi County, one of the ten counties in Kenya, has a TB case notification rate that exceeds the national average. Consequently, our research was conducted at KNH, which is the largest teaching and referral hospital in Kenya. KNH not only serves as a prominent public hospital but also houses two academic medical institutions, namely the University Of Nairobi School Of Medicine and the Kenya Medical Training College. With a bed capacity of 2000 and a consistently high bed occupancy rate exceeding 100%, KNH employs a staff of over 5,000 individuals. The hospital manages approximately 2000 outpatients on a daily basis, with a daily footfall of over 10,000 people. On average, the hospital diagnoses around 200-300 TB cases each month, most of which are subsequently referred to peripheral health facilities for further care and follow-up. The hospital's anti-tuberculosis treatment follows the WHO-recommended regimens 2HRZE/4HR for new TB patients and 2HRZES/1HRZE/5HRE for retreatment patients (Mburu, 2020). Both diagnostic and treatment services are provided free of charge. A retrospective study was carried out at KNH, Nairobi County, between July and August 2022. The study randomly selected participants, including 127 TB patients aged ≥15 years. Data was collected through face-to-face interviews using a questionnaire and analyzed using SPSS version 20.0. The median was used as the cut-off value to analyze patient delay. Multivariable logistic regression analysis was conducted to identify factors associated with patient delay. A statistically significant association was declared if the p-value was ≤ 0.05 with a 95% confidence interval.

2.2. Target Population

Adults of more than 15 years and above with newly diagnosed pulmonary tuberculosis on treatment for less than six months will be interviewed at KNH recruitment site. Enrolment for consenting patients in a systematic manner until the sample size is reached. Patients with a prior history of tuberculosis therapy (retreatment cases), extra-pulmonary TB, and those who do not live in Nairobi were excluded.

2.3. Sample size and sampling procedure

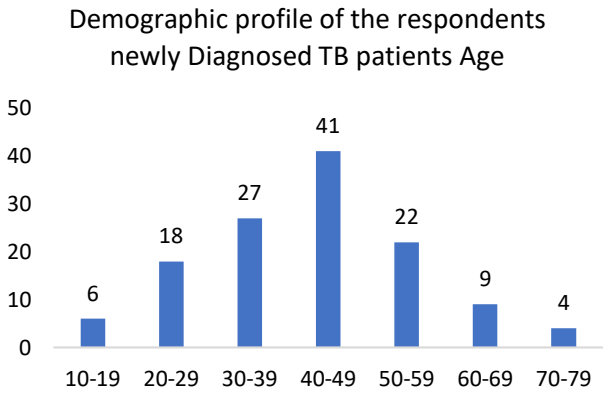
Patients' registration books were utilized as a sampling frame to gather the requisite sample. During clinic opening hours, new smear positive pulmonary TB patients were chosen, and a consecutive sampling strategy was adopted. A rigorous random sample technique was used to choose the study's participants. A suitable sampling interval (K) was calculated after the required sample size of 128 persons has been gathered; divide the total estimated population size by the sample size. K = total number of participants in the study divided by total number of participants in the sample. The first subject was chosen at random, followed by the remaining elements once the kth element has been chosen. The number 3 was assigned to topic 1, and the number 3+kth (3+2=5) was assigned to subject 2. The subjects were chosen until there were 128 participants in the study. The chosen individuals' data was abstracted, and they were contacted for a follow-up interview to learn more.

2.4. Data Collection tools

The study collected information on socio-economic and demographic factors (sex, age, education level, marital status, monthly income, etc.) and medical history (patient's underlying disease, primary symptoms, substance abuse, first consultation facility, knowledge on tuberculosis disease and whether TB-related tests were taken at the first visit, etc.). In addition, the survey also covered questions on individuals' disease awareness and their healthcare-seeking behaviors. Furthermore, the random sampling error was decreased due to the probability sampling approach used for sample selection. The researcher visited a chest clinic as part of the study. Each visit took place on a clinic day (typically weekdays), during which all newly diagnosed patients and those in the intensive phase of therapy was assessed, and medications for the following week was collected. After the practitioner had seen the patients, the questionnaire was administered in a separate room. After receiving informed consent, each respondent was given ten to twenty minutes to complete the questionnaire.

2.5. Data Management and analysis

The descriptive analysis on patient characteristics and clinical data was performed. Categorical variables were presented as frequencies and percentages. Then, the chi-square ($\chi 2$) test was employed to compare categorical variables. To analyze the potential influenced factors of patient delay and health system delay, univariate logistic regression analysis was done and the variables with the $\chi 2$ test of findings $P < 0.1$ were retained to avoid the loss of possible factors. Statistically significant results of univariate analysis were subjected to binary stepwise logistic regression analysis, and all results were two-tailed, with $p < 0.05$



considered statistically significant. Data was entered using EPI-info version 7, which was subsequently exported to SPSS version 25 for analysis. The crude significant relationship between each independent variable and dependent variables was determined using binary logistic regression. To declare a significant relationship with the outcome variable, variables with a P value of less than 5% and a 95 percent confidence interval was considered. Tables, figures, and graphs were used to examine and convey key descriptive variables. Categorical variables were summed as frequencies and percentages, and column graphs was used to represent them. Column graphs with percentages showing the distribution of TB treatment outcomes by gender, patient type, and age group. Categorical variables were summed as frequencies and percentages, and column graphs was used to represent them. Column graphs with percentages showing the distribution of TB treatment outcomes by gender, patient type, and age group.

3. Results/Findings

3.1. Socio-demographic and characteristics of the patients

Females were the majority with 51.2% (n = 65). The age with the highest frequency was between (40 – 49) 32.3% (n = 41). On marital status, cohabiting was the highest 43.3% (n = 55). Study indicated that those who reached primary/secondary were majority 59.1% (n = 75). On occupation, those who were independent was high 36.2% (n= 41). Cross tabulation between age and seeking treatment for the first time was significant at P < 0.05 (P = 0.003. The health care workers were identified as the best in terms of who can reduce TB 44.9% (n = 57). The TB patients felt that they should be given free medication

Figure 1. Age of the respondents newly diagnosed with TB

Table 1. Number of childı

96.1% (n = 122). On how they felt upon being told that they had TB, 66.9% (n = 89) were scared. Distance from health facility and where they got first diagnosis/treatment was statistically significant at P < 0.005 (P = 0.004), Distance from where they stay, and time taken to seek treatment was significant at P < 0.05 (P = 0.005). The respondent took between two to three months before seeking medical treatment 29.9% (n = 38). The patient him/herself 40.2% (n = 51) indicated that they are better in term of reducing delay in TB diagnosis and treatment.

		Who do you think can better reduce the delay in the diagnosis and treatment for TB?				Total	Significant
		The patient	The family	The health system	The Government		
Number of children living in the house	0	7	0	1	1	9	$\chi 2 = 47.848$ d.f - 18 P = 0.000
	1	8	1	16	2	27	
	2	21	2	32	7	62	
	3	10	0	6	4	20	
	4	3	0	2	0	5	
	5	2	0	0	1	3	
	6	0	1	0	0	1	
Total		51	4	57	15	127	

3.2. Associations and interactions of the key variables

The study revealed that 66.9% (n =85) were scared, followed by those who were depressed 21.3% (n = 27) while 11% (n = 14) did not believe that they had TB illness when asked on how they felt upon being told they had TB. This indicates that TB is a serious disease, and nobody would be happy to be

infected. Bivariate analyses results showed people with TB were discriminated against in the community 96.9% (123) while only 3.1% (n = 4) said NO meaning they felt that there is no discrimination when you are diagnosed with TB at the community. This is again because of the seriousness people look at TB disease. The study revealed that those who took two to three months before seeking for medical treatment after contracting TB were the majority 29.9% (n = 38) followed closely by those who took less than a month 20.5% (n = 26). The long period of two to three months was taken because of making diagnosis from one hospital to the other before finally getting help from KNH. There was association between the time taken to seek for treatment and the appearance of the first symptoms ($\chi 2$ = 151.861, d.f – 116, P = 0.014). Majority of the respondents 85.0% (n = 108) indicated that they were informed of possibilities of having TB while 15% (n = 19) were not informed or they did not have clue. The study indicated that 96.1% (n = 122) took some form of treatment before being diagnosed with TB. Some 3.9% (n =5) did not take any medication before diagnosis was made. This is because by the time diagnosis is done, the patient has symptoms that needed to be addressed. Majority of the respondents 44.9% (n = 57) said that health systems helped to reduce delay in TB diagnosis and treatment. Those who believed in themselves as patients that they contributed to reduction of delay in TB diagnosis and treatment were 40.2% (n = 51). Patients believed on healthcare systems and by themselves. , The study revealed that 89.4% (n = 125) of the TB patients were on TB treatment at the time of the study compared with those who were not on treatment 1.6% (n = 2).

The study found out on table 28 above that Number of children living in the house and who better reduce the delay in the diagnosis and treatment was significant at ($\chi 2$ = 47.848, d.f – 18, P = 0.000). The finding reveals that the only social economic characteristic that had association with had better reduce the delay in the diagnosis and treatment was number of household children one had. This is because the households feared transmitting the TB to their families.

4. Discussions

Our study findings show that more than half of the patients were women, which is consistent with the 2016 TB prevalence survey report (Center for Health Solutions, 2017), which showed that women had a higher burden of TB. This gender difference could be due to higher prevalence of co-morbidities and lower immunities among women, or due to gender-related differentials in health-seeking behaviors (Mau-vais-Jarvis et al., 2020).

The focus group discussion indicated that unprofessional attitude from healthcare workers Findings also revealed that the attitude of health workers affected the delivery of TB care. Sometimes, the healthcare workers were not very approachable at times. Some participants shed light on the way patients were handled at times: sometimes-healthcare workers shout at the patients, and this brings. For example, one patient was not fully examined because he was not an admitted patient. The patient returned home only to come later when he was critically ill. One of the reasons for the bad attitude was because the healthcare workers were afraid; they would be infected with TB. They were deeply concerned about the risk of contracting the disease from their patients. They were afraid of working in the TB wards. Some lab technicians were also afraid to handle and process the TB samples (WHO. 2016).

The finding revealed that the only social economic characteristic that had association would better reduce the delay in the diagnosis and treatment was number of household children one had. This is because the households feared transmitting the TB to their families. The study further revealed that Lack of time and not aware of the severity of my symptoms were the greatest contributing factors of the patients delay in seeking treatment for symptoms that lead to the diagnosis of TB (13.4%, n = 17), followed closely by did not have money to go to the hospital (7.9%, n = 10), other factors were, not aware of the severity of symptoms, fear of rejection/ losing job, was on medication from private clinic, was taking herbs prescribed by herbalist, difficult access to health center/transportation issues, not having a previous satisfactory experience with the health system.

5. Limitations of the study

This study had several limitations. First, KNH as a large public hospital has a fluctuating population of patients, with a treatment roster that includes indigent patients, prisoners, and patients referred from faraway locations who struggle with transportation to remain enrolled in any TB treatment scheme. Second, many people may have opted for private sector treatment and hence were not included in this study. Third, information on CPT and ART was self-reported by patients and could not always be verified. A final limitation is related to the small sample size, which may have blurred the association between certain parameters and diagnosis and

treatment outcomes. Covid-19 and lock-down limited movement for both healthcare systems and patients.

6. Conclusion

TB case notification rates among hospital staff were high and treatment outcomes were worse than for the general population. There is an urgent need to prioritize staff in this large hospital as a vulnerable group for TB disease and to institute effective infection control measures. An effective TB diagnosis and treatment team is crucial in preparing for TB management at the facility. Due to the nature of the illness, TB patients and their households can face severe direct and indirect financial and economic costs. These pose barriers that can greatly affect their ability to access diagnosis and treatment, and to complete treatment successfully. In contrast to SDG Indicator 3.8.2, the TB-specific indicator is restricted to a particular population: people diagnosed with TB who are users of health services that are part of NTP networks (Denholm JT .2021 et al.).

Ethical approval and consent to participate

Permissions to conduct the study were obtained from the Head of Respiratory and Infectious Diseases Unit and Ethical approval sought from the KNH/UoN Ethics and Research Committee, MKU and NACOSTI. Confidentiality was assured on all the information obtained from the patients' registers.

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World Health Organization: 2021

World Health Organization-Global Tuberculosis Report: 2022

DECLARATION

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Magoba Ronald Arnold

PhDPH/2020/65046

Sign _____ Date 5/01/2023.

Declaration by Supervisors:

This thesis will be submitted to Mount Kenya University with approval as university supervisors.

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Signature.....Date.....5/9/2023.....

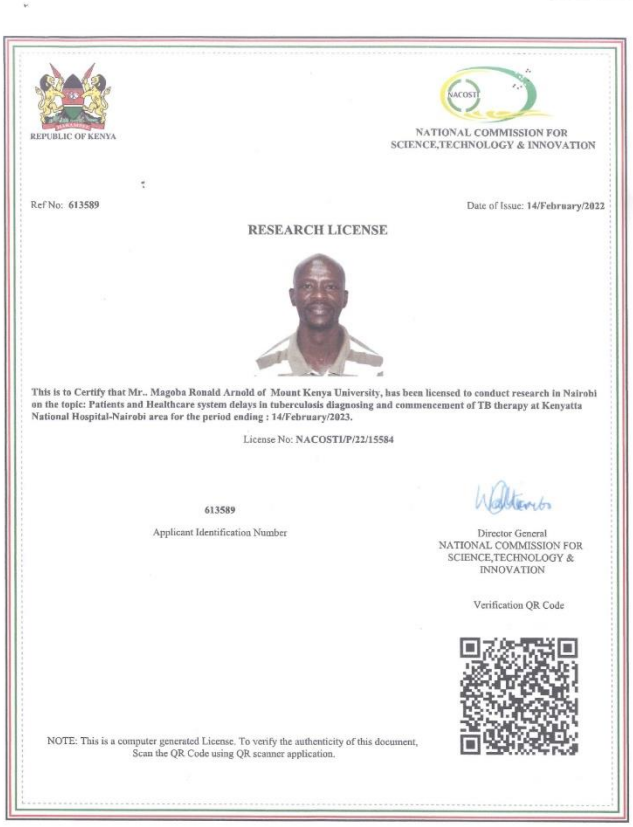
Dear Editor-in-Chief,

I am Submitting my manuscript titled " **Patient and Healthcare System delays in diagnostics and treatment delay among TB patients aged 15 years and above at Kenyatta national hospital, Nairobi county**" authored by Researcher et al. I kindly request for the manuscript to be reviewed for publication.

Please inform me of your decision at your earliest convenience. With my best regards,

Sincerely yours,

A Researcher, PhD



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